

Comparison of efficacy of ivermectin and doramectin against mange mite (*Sarcoptes scabiei*) in naturally infested rabbits in Turkey

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Summary

The authors used 14 New Zealand rabbits (5 naturally infested rabbits and 9 in contact rabbits) for *Sarcoptes scabiei* treatment in this study. Signs, such as itchy ears, eyes, tail and abdominal skin, alopecia and pyoderma, were considered to be the cause of these disorders. Infested rabbits were grouped according to the intensity of *S. scabiei* infestation (low, medium and high). Each group was then divided into two subgroups; in one subgroup the rabbits received ivermectin (1%) and, in the other, doramectin (1%). All subgroups received a subcutaneous injection at a dosage of 400 µg/kg body weight every 80 h on three occasions. On day 28 after commencing the treatment, all the rabbits in the first two groups had recovered completely. Although both drugs were applied at the same time and at the same dose, the third group (high degree of infestation), revealed, both microscopically and macroscopically, that ivermectin has more rapid effect than doramectin. Treatment was effective in all groups.

Keywords

Doramectin, Infestation, Ivermectin, Mange, Mite, Rabbit, *Sarcoptes scabiei*, Turkey.

Studio comparativo dell'efficacia di ivermectina e doramectina sull'acaro della scabbia (*Sarcoptes scabiei*) in conigli naturalmente infetti in Turchia

Riassunto

In questo studio gli autori hanno sottoposto a trattamento per l'acaro della scabbia (*Sarcoptes scabiei*) 14 conigli Nuova Zelanda (5 naturalmente infetti e 9 posti a contatto con l'acaro). Tra i sintomi di questa malattia sono stati osservati prurito a orecchie, occhi, coda e pelle dell'addome, alopecia e pioderma. I conigli infettati sono stati raggruppati in base alla presenza di *S. scabiei* (bassa, media ed elevata). Ogni gruppo è stato suddiviso in due sottogruppi: il primo ha ricevuto ivermectina (1%) e il secondo doramectina (1%). Tutti i sottogruppi sono stati trattati con iniezione sottocutanea alla dose di 400 µg/kg di peso corporeo ogni 80 ore per tre volte. Al giorno 28 dall'inizio del trattamento, tutti i conigli dei primi due gruppi sono risultati completamente ristabiliti. Sebbene i due farmaci siano stati somministrati alla stessa ora e alla stessa dose, il terzo gruppo (esemplari altamente infetti) ha evidenziato, sia a livello microscopico sia macroscopico, un effetto più rapido dell'ivermectina rispetto alla doramectina. Il trattamento è risultato efficace in entrambi i gruppi.

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Parole chiave

Acaro, Coniglio, Doramectina, Ivermectina, *Sarcoptes scabiei*, Scabbia, Turchia.

Introduction

Sarcoptic mange is a significant disease of wild and farm animals. Infested animals can lose condition and die (2). *Sarcoptes scabiei* is the agent that causes infestation which affects the ears, nose, feet and the areas around the genitalia; it also causes pyoderma and itching. Ear mange caused by *S. scabiei* infestation is a very common and widespread problem in rabbit colonies. Animals affected by *S. scabiei* are hypertensive and suffer weight loss and infestation may lead to complications and death due to the development of secondary infections. This is why treatment should be administered immediately (2, 12).

The avermectin drug group includes ivermectin, abamectin, doramectin, eprinomectin and celamectin which can be used to treat rabbits that are naturally infested with *S. scabiei* (8, 9, 14).

Our study was designed to investigate the effect of ivermectin and doramectin on rabbits that were naturally infested with *S. scabiei*. The differences in effectiveness of the two drugs in the avermectin group were studied on rabbits that were brought to the Dokuz Eylül University Laboratory Animal Science Department from another laboratory and also on rabbits bred in the department.

Materials and methods

The study was approved by the local Ethics Committee of Experimental Studies at the Dokuz Eylül University School of Medicine.

Laboratory animals

Five 1-2 year-old New Zealand rabbits were placed in quarantine for a period of 14 days. After ensuring that the rabbits were not affected, they were taken to a room in which the rabbits of the unit were also kept. Food and water were available *ad libitum* and the animals were kept in the dark for 12 h and in the light for 12 h each day. Nine of the rabbits in the unit were infested by the five newcomers.

Macroscopic and microscopic examinations of these 14 rabbits revealed that they were infested by *S. scabiei*. Treatment of these animals was scheduled as part of our research, after which they were placed in the breeding room.

Clinical and laboratory examinations

After clinical examination, each of the rabbits was marked. Each rabbit received a score, depending on its degree of infestation, as follows:

- 'low' (group 1)
- 'medium' (group 2)
- 'high' (group 3).

All animals were placed in six cages (each 716 × 716 × 460 mm), with two cages for each group.

Skin scrapings from each rabbit were taken from at least three different sites, such as the ears, feet, nose, eyes, tail or inguinal region. These scrapings were placed in a Petri dish which was closed and isolated with plaster.

Each sample was dissolved in 5 ml of a 10% solution of potassium hydroxide (KOH). The mixture was stirred, centrifuged and the supernatant discarded. From each sample, a few drops of solution were placed on a slide for examination using a light microscope under ×10, ×20 and ×40 magnification. Three samples obtained by brushing the lesions from each infested animal were evaluated by Inceboz and Kolatan and graded as low (++) , medium (+++) and high (++++) when 2-4, 5-7, 8-10 *S. scabiei* were found microscopically at ×10 magnification, respectively. The group of low infestation scored ++, the medium group +++ and the group of high infestation scored ++++ (Table I).

Treatment

Both group I (rabbits that had received ivermectin) and group D (rabbits that had received doramectin) received three subcutaneous injections at a dosage of 400 µg/kg of body weight every 80 h (ivermectin: Zimec, Tekno Vet Pharmaceuticals, Istanbul; doramectin: dectomax, Pfizer Pharmaceuticals, Istanbul).

The clinical and parasitological examinations of the 14 rabbits were performed on day 0 (prior to treatment) and on days 4, 8, 14 and 28 during treatment (1, 6, 7, 11).

Results

In highly infested rabbits, the ear lobes, eyes, skin of the nose, most of the skin of the feet and in medium infested rabbits, the skin of the ears, the skin around the eyes and nose had crusts and were erythematic prior to treatment. The mean lesions score of the ear lesions of different groups of rabbits (groups I to III), recorded before and after treatment, is shown in Table I.

The parasitological and clinical examinations revealed that these rabbits were naturally

contaminated by eggs, larva, nymph and adult stages of *S. scabiei* (Table I).

Clinically and parasitological examinations were conducted on days 1, 4, 8, 14 and 28. For parasitological examinations, skin scrapings were taken to identify the mange agents. After commencing treatment, a rabbit treated with ivermectin in the group of medium infestation had died prior to receiving the second dose (Table II).

On day 4, the recovery rate, especially among rabbits with a high degree of mange infestation, was slower in rabbits that had received doramectin compared to those to which ivermectin had been administered. The crust shedding rate in the group that had received doramectin was slower in the first 80 h than in the group to which ivermectin had

Table I
Clinical and microscopic parasitological examination of the mange-infested rabbits before treatment

Intensity of infestation	Group No.	Area of alopecia	Degree of alopecia	Intensity of itchiness	Degree of crust formation	Causal species and intensity of lesions
Low	G1-1 (I)	Ears	+	++	++	<i>Sarcoptes scabiei</i> (+)
	G1-2 (I)	Ears	+	++	++	<i>S. scabiei</i> (+)
	G1-3 (D)	Ears (bleeding)	+	++	++	<i>S. scabiei</i> (+)
	G1-4 (D)	Ears, eyes, paws	+++	++	++	<i>S. scabiei</i> (++)
	G1-5 (I)	Paws, ears, nose	++	++	++	<i>S. scabiei</i> (++)
Medium	G2-1 (I)	Nose, paws, tail, dorsal region	+++	+++	+++	<i>S. scabiei</i> (+++)
	G2-2 (D)	Eyes, nose, ears, paws	++	+++	+++	<i>S. scabiei</i> (+++)
	G2-3 (D)	Nose, paws, ears, tail	+++	+++	+++	<i>S. scabiei</i> (+++)
	G2-4 (D)	Nose, paws, eyes, lip, tail	+++	+++	+++	<i>S. scabiei</i> (+++)
	G2-5 (I)	Ears, nose, dorsal region, paws, eyes	+	+++	+++	<i>S. scabiei</i> (+++)
High	G3-1 (D)	Eyes, nose, ears, paws, tail, inguinal region	–	++++	++++	<i>S. scabiei</i> (++++)
	G3-2 (D)	Nose, eyes, paws, ears, inguinal region, tail	++	++++	++++	<i>S. scabiei</i> (++++)
	G3-3 (I)	Nose, eyes, paws, ears, inguinal region, tail, dorsal region	++++	++++	++++	<i>S. scabiei</i> (++++)
	G3-4 (I)	Nose, eyes, paws, ears, inguinal region, tail, dorsal region	++	++++	++++	<i>S. scabiei</i> (++++)

I ivermectin
D doramectin
+ present
++ low
+++ medium
++++ high

Table II
Findings of clinical and microscopic examinations performed after commencement of treatment

Group No.	Animal No.	1		4		Day 8		14	
		Mange agent	Alopecia degree	Intensity of itchiness	Shedding of crust	Mange agent	Alopecia degree	Intensity of itchiness	Shedding of crust
G1 Low degree mange	G1-1 (I)	+	+	++	+	-	+	No itching	No crust
	G1-2 (I)	+	+	++	+	-	+	No itching	No crust
	G1-3 (D)	+	+	++	+	-	+	No itching	No crust
	G1-4 (D)	++	+++	++	+	+	++++	No itching	No crust
	G1-5 (I)	++	++	++	+	+	++++	No itching	No crust
G2 Medium degree mange	G2-1 (I)	+++	Died				Died		
	G2-2 (D)	+++	++	+++	++++	++	++++	++	+++
	G2-3 (D)	+++	+++	+++	+++	++	++++	++	+++
	G2-4 (D)	+++	+++	+++	++++	++	++++	No itching	+++
	G2-5 (I)	+++	+	+++	++++	++	++++	++	+++
G3 High degree mange	G3-1 (D)	++++	-	++++	++++	+++	+++	+++	+++
	G3-2 (D)	++++	++	++++	+++	+++	++	+++	+++
	G3-3 (I)	++++	+++ +	++++	+++	++	++++	+++	+++
	G3-4 (I)	++++	++	++++	+++	++	+++	++	+++

I ivermectin
D doramectin
+ present
++ low
+++ medium
++++ high

been administered which were in same 'degree of infestation' group.

The clinical examination performed on day 8 after commencing treatment revealed that, in rabbits in the group of low infestation, both drugs had effectively decreased the microscopic appearance of the mange agent while, among rabbits in the medium and high degree infestation groups, ivermectin was more effective.

On day 28, all rabbits that had received either ivermectin or doramectin had recovered. Upon parasitological examination, there was no presence of larva, nymph or the adult stages of *S. scabiei*. Consequently, it was concluded that

doramectin and ivermectin were effective in all groups. On day 28, clinical findings revealed that the itching and crust had disappeared in all low-, medium- and high-degree infested rabbits. A microscopic examination did not reveal living mange agents in any of the rabbits. After disappearance of crusts, hair growth in previously infested areas was observed in all infested rabbits, (Table II).

Discussion

Previous studies on the effects of ivermectin and doramectin on ear mange in rabbits recommended the use of different dosages and

administration regimens (11). Moxidectin 1% injectable solution has been shown to be effective in the treatment of sarcoptic mange in rabbits (15). Doramectin is highly effective against various causative agents of mange. Doramectin is used subcutaneously at a dose of 200 µg/kg for the treatment of *S. scabiei* and *Psoroptes cuniculi* infestation (7, 10, 14). In a previous study, rabbits that were naturally infested with *P. cuniculi* mites showed complete recovery after a single subcutaneous ivermectin injection of 200 µg/kg body weight (13). Harrenstien *et al.* reported that *P. cuniculi* infestation required the subcutaneous administration of two doses of 1% ivermectin solution (300-400 µg/kg) with an interval of 14 days between each injection (4), while Hillyer suggested the administration of three doses (3, 5).

In our study, after commencing the treatment, a rabbit treated with ivermectin in the medium infested group had died before receiving the second dose. Itching was still present among the other animals in group 2. On day 14, dead mange agents were observed in the low and medium infestation groups, although no live mange agents were seen in some of the rabbits in the high infestation group. The itching disappeared in low and medium degree infested rabbits but was partly present in the high degree group of infested rabbits. The clinical examination which was performed on day 28 revealed that rabbits in the groups of low and medium infestation, crusts had been shed completely and hair had started to grow again in those areas. In animals that had a high degree of mange, crust shedding and hair growth was average. The parasitological examination which was conducted on day 28 showed that there were dead mange agents in the group of high infestation and, on clinical examination, all animals were cured and had

shed crusts and hair had grown again (Table II).

In the investigation, we observed that the animals taken from outside our laboratory showed signs of infestation after the quarantine period (14 days). When we consider the life-cycle of *S. scabiei*, the quarantine period should be 30 days instead of 14 days to control such infestations.

The problem of infestation of laboratory staff was taken into account and health controls were conducted. It is extremely important to wear gloves and a laboratory coat, especially while studying laboratory animals whose health status was unknown. Although *S. scabiei* generally does not cause infestation in humans, it is better to be cautious.

Conclusions

This study demonstrated that rabbits infested by the *S. scabiei* mange agent can be cured by using three doses of ivermectin or doramectin once every 80 h. Clinical and parasitological examinations revealed that although there is no effective difference between doramectin and ivermectin, ivermectin appears to act more rapidly than doramectin; this difference can be explained by the degree of infestation. The rapidity of cure in the low and medium infestation groups appears to correlate with the mange agent load at the beginning of the study, irrespective of the type of treatment (either ivermectin or doramectin). In the group of high infestation, ivermectin appeared to act more rapidly but it is obvious that two animals for each treatment group is insufficient to draw a strong conclusion on this. Future studies may shed light on this issue.

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